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ABSTRACT

This report analyzes the effect of the California Dental Disease Prevention Program (DDPP). The program includes education about dental health and nutrition, daily toothbrushing and flossing, and weekly application of a fluoride mouthrinse. The DDPP serves approximately 350,000 elementary school children. The implementation of the DDPP is described in the first chapter. Chapter two summarizes the methodology of the study of the program conducted by the Center for Dental Services Research of the University of California, San Francisco. The third chapter reports the results and shortcomings of the study. In chapter four a discussion is presented on the impact of the program on state expenditures for medical and dental care. A description is given in chapter five of the options for improving the program's cost-effectiveness, and chapter six presents conclusions and recommendations. (JD)

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AN EVALUATION OF THE SCHOOL-BASED DENTAL DISEASE PREVENTION PROGRAM

APRIL 1986

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INTRODUCTION

Chapter 1134, Statutes of 1979 (SB 111), established a Dental Disease Prevention program (DDPP) for California's school children. The program includes education about dental health and nutrition, daily toothbrushing and flossing, and weekly application of a fluoride mouthrinse. Participation is voluntary at the county, school, and classroom levels; and parental consent is required for the mouthrinse component of the program.

The DDPP is administered at the state level by the Department of Health Services (DHS). At the local level, the program is administered by county health departments or by local school districts (as subcontractors).

Chapter 1134 appropriated $200,000 for state administrative expenses and $1.9 million for local program operation. The 1980-81 school year was the first year of program operation. After the first year, the program was funded from an appropriation in the annual Budget Act.

In 1984-85, 327,000 elementary school students participated in the program. These students represented approximately 15 percent of the enrollment for grades K-6. Expenditures in 1984-85 totaled approximately $1.8 million.

The DDPP is intended to reduce the incidence of tooth decay and gum disease among California residents. In order to determine whether the program is, in fact, producing the desired results, Chapter 1134 directed the Legislative Analyst to evaluate the DDPP in its fourth program year. This report was prepared in response to that directive. It analyzes the

program's cost-effectiveness, as well as its impact on state expenditures for medical and dental care. The analysis is based primarily on a study of the DDPP that was funded by the DHS and conducted by the Center for Dental Services Research of the University of California San Francisco (UCSF).

This report is divided into six chapters. In Chapter I, we describe the implementation of the DDPP. In Chapter II, we summarize the methodology of the UCSF study. Chapter III reports the results and shortcomings of the study. In Chapter IV, we discuss the impact of the program on state expenditures for medical and dental care. Chapter V describes the options for improving the program's cost-effectiveness, and Chapter VI presents our conclusions and recommendations.

This report was prepared Mary Jo Anderson, under the supervision of Carol Bingham.

SUMMARY OF FINDINGS AND RECOMMENDATIONS

This report analyzes the effect of California's Dental Disease Prevention program (DDPP). The program was established by Ch 1134/79 and currently serves approximately 350,000 elementary school children. The DDPP is a school-based program in which the children brush and floss their teeth daily, use a fluoride mouthrinse once per week, and receive dental health education. Participation is voluntary at both the county and classroom levels.

The state spent an estimated $1,790,000 on the DDPP in 1984-85. (Some local agency claims for reimbursement are still outstanding.) Of this amount, $1,391,000 was spent for local assistance, $385,000 went for administrative expenses at the Department of Health Services, and $14,000 was used to complete a study of the program.

Most of the data on the DDPP was developed by the Center for Dental Services Research located at the University of California, San Francisco (UCSF). The UCSF group conducted two dental health examinations of children in Monterey and San Bernardino Counties. It examined sample groups early in the first year of the program, and again two years later, to determine whether the program had reduced the incidence of tooth decay and gum disease among students who had participated for the full two years.

The results of the study generally were inconclusive with regard to tooth caries (cavities) but showed some statistically significant reduction in gum disease. As we discuss in detail in our report, however, problems in the design and implementation of the study made the statistical results

unreliable. In particular, the loss of over 60 percent of the original participants, a low initial rate of tooth decay and gum disease, and the lack of a true control group limit the reliability and significance of the observed data.

The study also found that about half of the tooth decay in primary teeth occurs before children even enter kindergarten and that the majority of decay in permanent teeth occurs on tooth surfaces which can be protected by sealants (a synthetic coating placed on the chewing surface of certain molars).

The general trend in the data, the results of studies covering similar programs, and conversations with regional administrators suggest that the DDPP does improve the dental health of participants, despite the generally insignificant statistical results of the UCSF study. We are unable to estimate the magnitude of this improvement or to attach a dollar value to the reduction in restorative dental work that results from it.

We can conclude, however, that even if the DDPP prevented all current restorative work among participating Medi-Cal eligibles, program costs would exceed the Medi-Cal savings. On the other hand, the total long-range savings to the state, program participants, and their parents may well exceed the cost of the DDPP. Any decision on continuing the program, then, rests on deciding what the goal of the DDPP is.

The UCSF study, other studies, and the local administrators also suggest that the program would be most cost-effective if it could be targeted at certain high-risk populations. Communities with nonfluoridated water, and relatively more nonwhite and immigrant inhabitants, for example, appear to benefit the most from the DDPP or similar programs. Targeting

the program would require changes in program components and/or the selection of program participants.

If the Legislature chooses to continue the program, and to attempt to target high-risk children, we recommend that it:

- Direct the Department of Health Services to give preference to school districts with nonfluoridated drinking water, high immigrant populations, and high AFDC caseloads when it allocates funds.
- Establish a pilot project for sealing the newly erupted 6- and 12-year molars for a test group of DDPP participants.
- Ask the Department of Health Services to investigate the feasibility of incorporating a DDPP into the curricula of preschool programs that serve high-risk populations.
- Direct the Department of Health Services to assist rural counties in establishing cooperative programs to reduce costs.

CHAPTER 1

THE CHILDREN'S DENTAL DISEASE PREVENTION PROGRAM

Chapter 1134, Statutes of 1979 (SB 111), established the Children's Dental Disease Prevention program (DDPP). In passing this measure, the Legislature sought to reduce the incidence of tooth decay and gum disease in the state's school population and inculcate lifelong dental health habits. The program consists of periodic educational sessions about dental health and nutrition, daily flossing and brushing, and a weekly mouthrinse with a fluoride solution. All of these activities take place at the classroom level.

ADMINISTRATION

Chapter 1134 designated the Department of Health Services (DHS) as the lead agency for the program. The department established the program's components in accordance with the general statutory directive to include educational programs, plaque control, and supervised application of topical prophylactic agents for caries (cavity) prevention. The Department of Education assisted the DHS by acting as a liaison with the teachers who carry out the program. The administrative agency at the local level is the county health department, although the health department may designate a school district or other public or nonprofit agency to act for it.

IMPLEMENTATION

During 1979-80, the DHS hired staff, developed program requirements, and sent requests for proposals on the dental program to all 58 counties. The department required counties to describe in their proposals how they

would structure each of the program components, train and supervise teachers, organize an advisory committee, provide dental screenings and referrals for students, and evaluate the program. In its request for proposals, the department recognized that the reimbursement limit for local programs established by Chapter 1134--$3.00 per child--would not fully fund the program. Consequently, it required local agencies to submit evidence that they could supplement the state aid with local resources. Counties must resubmit this evidence, along with a detailed budget, each year in order to continue participating in the program.

The DHS awarded funds to applicants based on the extent to which the proposals would achieve the stated objectives, the ratio of local funds and volunteer services to state aid, the amount of scheduled follow-up and reinforcement time, evidence of community support, and the ability of budgeted staff to provide the proposed level of services.

Both the local agency and the DHS evaluate each county program annually. Programs are scored on the basis of content, materials, teaching methods, teacher effectiveness in the classroom, teacher training programs, the percentage of scheduled prophylaxis and mouthrinse operations that actually occurred, and whether reinforcement visits took place as scheduled. Schools must receive an evaluation rating of 75 percent or more to qualify for state DDPP funds.

Program Participation

In the first funding cycle (which covered the 1980-81 school year), 39 counties requested funds to serve 594,000 students. The amount of money available for that year ($1.5 million) allowed a maximum participation of 500,000 children. The department actually provided funding for 365,000

children, with most counties receiving 100 percent of the support they had requested. The major exception was Los Angeles County, which proposed to serve 240,000 students and was funded for 8,500. Table 1 shows requests and awards, by county, for 1980-81. The table also shows the number of students actually served in 1980-81 and the number funded in 1984-85.

Table 1

Dental Disease Prevention Program
Number of Participants Requested, Funded, and Served
By County

County	1980-81 Number Requested	1980-81 Number Funded	1980-81 Number Served	1980-81 Percent of Requests Funded	1984-85 Number Funded	Percent Change in Number Funded 1980-81 to 1984-85
Alameda	23,500	23,500	16,330	100.0%	20,000[a]	NA
Alpine				NA		NA
Amador	863	863	290	100.0	1,400	62.2%
Butte	2,200	3,200	1,660	145.5	5,000	56.3
Calaveras	500	500	119	100.0		-100.0
Colusa	709	709	69	100.0		-100.0
Contra Costa	26,000	26,000	19,446	100.0	23,000	-11.5
Del Norte				NA		NA
El Dorado	4,127			-0-	2,200	New
Fresno	5,000	5,000	2,669	100.0	4,000	-20.0
Glenn				NA		NA
Humboldt	4,000	4,000	3,369	100.0	6,000	50.0
Imperial				NA		NA
Inyo				NA		NA
Kern	3,000	3,000	525	100.0		-100.0
Kings				NA		NA
Lake				NA	2,000	New
Long Beach	18,053	16,000	7,044	88.6	3,000	-81.3
Los Angeles City				NA	10,000	NA
Los Angeles County	240,000	8,500	1,055	3.5	13,000	52.9
Madera	3,600	3,600	1,760	100.0	4,000	11.1
Marin				NA	4,000	New
Mariposa				NA		NA
Mendocino				NA		NA
Merced	5,000	5,000	133	100.0	4,000	-20.0
Modoc	560			-0-		NA
Mono				NA		NA
Monterey	5,000	5,000	3,721	100.0	10,000	100.0
Napa				NA		NA
Nevada	2,003	2,000	1,500	99.9	2,500	25.0
Orange	15,000	22,000	1,125	146.7	22,000	--
Placer	2,100	2,100	1,395	100.0		-100.0
Plumas				NA		NA
Riverside	20,000	20,000	10,879	100.0	20,000	--
Sacramento	12,000	14,500	15,390	120.8	25,000	72.4

a. Contract cancelled during the year.

Table 1--contd

County	1980-81 Number Requested	1980-81 Number Funded	1980-81 Number Served	1980-81 Percent of Requests Funded	1984-85 Number Funded	Percent Change in Number Funded 1980-81 to 1984-85
San Benito				NA		NA
San Bernardino	11,500	11,500	11,500	100.0	29,000	152.2
San Diego City				NA	10,000	NA
San Diego County	60,000	60,000	11,522	100.0%	33,000	-45.0%
San Francisco				NA		NA
San Joaquin	10,000	10,000	2,453	100.0	4,000	-60.0
San Luis Obispo	3,000	3,000	1,881	100.0	2,500	-16.7
San Mateo	12,000	12,000	8,125	100.0	5,000	-58.3
Santa Barbara	10,000	10,000	5,110	100.0	13,000	30.0
Santa Clara	42,000	42,000	29,457	100.0	7,000	-83.3
Santa Cruz	2,188	2,188	2,090	100.0	4,000	82.8
Shasta	1,650	1,650	774	100.0		-100.0
Sierra				NA		NA
Siskiyou	2,277	2,050	568	90.0	1,000	-51.2
Solano	11,625	11,625	6,435	100.0	12,000	3.2
Sonoma	3,300	3,300	1,240	100.0	4,400	33.3
Stanislaus	4,500	4,500	2,339	100.0	5,000	11.1
Sutter/Yuba	2,000	2,000	1,220	100.0	2,233	11.7
Tehama				NA	800	New
Trinity				NA		NA
Tulare	5,000	5,000	6,558	100.0	7,400	48.0
Tuolomne	1,300	1,300	1,305	100.0	2,100	61.5
Ventura	15,000	15,000	8,269	100.0	6,000	-60.0
Yolo	3,600	1,800	1,883	50.0	3,800	111.1
Statewide totals	594,155	364,385	191,208	61.3%	333,333	-8.5%

Only 184,000 of the 365,000 students for which funds were provided were served under the program in 1980-81. The discrepancy between the number of students funded and the number actually served resulted, in large part, from financial problems at the local level, which caused many agencies to curtail or eliminate their participation in the program. These problems were alleviated in 1981-82, when the Legislature increased the maximum per-student reimbursement rate from $3.00 to $4.50.

The distribution of funds changed significantly in 1981-82, as counties overcame the difficulties that they initially encountered in getting their programs up and running. Los Angeles County, for instance, tried hiring a private practitioner and then a private, nonprofit agency before it settled on the County Department of Education to supervise its program. This change, combined with a more realistic estimate of the students that could be served, prompted the DHS to increase the county's funding level in 1981-82 and subsequent years. The administration of programs in Los Angeles and San Diego Counties also has been divided among smaller, more manageable units.

Since 1981-82, requests, awards, and expenditures have been fairly evenly matched. Program participation has risen steadily, and in 1983-84 the number of students served (336,000) actually exceeded the maximum number that could be funded from the program's local assistance appropriation. In 1984-85 the DDPP served approximately 15 percent of total public school enrollment in the eligible elementary grades. Table 2 shows the percentage of program participation, by year.

Table 2

Proportion of Eligible School Children
Served by the Dental Disease Prevention Program

	1980-81	1981-82	1982-83	1983-84	1984-85
Grades eligible	K-3	K-4	K-5	K-6	K-6
Enrollment in eligible grades	1,142,620	1,459,019	1,777,026	2,106,071	2,169,101
Number served by the DDPP	189,631	244,262	329,808	335,951	327,369
Percent of eligible students served	16.6%	16.7%	18.6%	16.0%	15.1%

As Table 1 shows, several counties either have never participated in the program or have withdrawn from it. San Francisco opted not to participate in the DDPP because its water is fluoridated. It is one of the few large cities in the state with fluoridated water. Santa Clara County has withdrawn from the program due to a lack of teacher support. Teachers in Santa Clara prefer to participate in an older, local program that does not require in-class brushing and flossing or teacher in-service training. The other nonparticipants are all rural counties, where the cost of the DDPP exceeds the local assistance reimbursement rate by a significant amount. Rural counties that participate in the program reported per-student costs of as much as $13.66 in 1983-84, versus a reimbursement rate of $4.50 per child.

EXPENDITURES

Table 3 shows state administration and local assistance expenditures under the DDPP since 1980-81.

Table 3

Dental Disease Prevention Program
Number of Participating Students and State Expenditures

	1980-81	1981-82	1982-83	1983-84	1984-85
State administration					
Department of Health Services	$325,181	$389,314	$294,416	$292,858	$385,000
Department of Education	60,000	30,000	--	--	--
Evaluation--UCSF	16,146	39,978	--	55,327[b]	14,000
Local assistance	559,291	1,020,030	1,312,893	1,282,337	1,390,694[a]
Totals	$960,618	$1,479,322	$1,607,309	$1,630,522	$1,789,694
Number of students	189,631	244,262	329,808	335,951	327,369
Local assistance per student[c]	$2.95	$4.18	$3.98	$3.82	$4.25[a]
(maximum amount)	($3.00)	($4.50)	($4.50)	($4.50)	($4.50)
Total state cost per student (excluding UCSF costs)	$4.98	$5.89	$4.87	$4.69	$5.42[a]

a. Estimate.
b. Federal funds supplied $18,254 of this amount because part of the study involved the effect of fluoridated water on caries prevention.
c. See Table 4 for full local cost per student.

State Administrative Expenditures

Chapter 1134 appropriated $140,000 to the DHS for administrative expenses, and $60,000 to the Department of Education to develop dental education materials for use in the DDPP. The costs of administering the program exceeded the appropriation in 1980-81; the difference was made up by using funds from the DHS support appropriation in the 1980 Budget Act. Since 1980-81, program administration has been funded by the Budget Act. Expenditures for administration were $385,000 in 1984-85, including direct costs and DHS overhead. The cost of the evaluation study conducted by the UCSF totaled $125,451 over a five-year period.

Local Assistance Expenditures

Chapter 1134 appropriated $1.9 million from the General Fund for local assistance to schools participating in the DDPP. The DHS intended to use $1.5 million of this amount in 1980-81 to fund 500,000 participants at the statutorily set rate of $3.00 per child. The department, however, actually awarded only $1,094,835 to participating schools. Since many local jurisdictions withdrew from the DDPP because they were experiencing financial difficulties, only $559,291 was actually spent by local agencies in 1980-81.

The 1981 Budget Act appropriated $900,000 from the General Fund to support the DDPP in 1981-82. This amount was intended to continue the program at the $1.5 million level, based on the assumption that $600,000 would remain available from the Ch 1134/79 appropriation. Since the reimbursement rate was increased to $4.50 per student in 1981-82, the $1.5 million could have supported 333,333 students. Expenditures, however, totaled only $1 million.

Since 1982-83, the DDPP has been funded entirely from appropriations contained in the annual Budget Act, as follows: 1982-83--$1.5 million, 1983-84--$1.5 million, 1984-85--$1,545,000, and 1985-86--$1,608,000.

Total State and Local Costs

The total cost of serving the average participating student, including both state and locally funded costs, exceeds the maximum state reimbursement rate ($4.50). As Table 4 shows, expenditures in 1983-84 averaged $5.91 per student for those counties that reported their total costs. The average cost per student ranged from $3.74 for Alameda County to $13.66 for Lake County. Urban counties report the lowest costs; rural counties, where professional staff usually must travel widely to reach a relatively small number of students, report the highest costs. (The cost figures shown in Table 4 should be used with caution because many counties do not fully allocate their administrative and other costs to the DDPP.)

Table 4

Dental Disease Prevention Program
Total Local Cost per Student
1983-84

County	
Alameda	$3.74
Amador	NA
Butte	NA
Contra Costa	6.58
El Dorado	4.50
Fresno	7.67
Humboldt	NA
Kern	NA
Lake	13.66
Long Beach	NA
Los Angeles City	NA
Los Angeles County	3.84
Madera	NA
Marin	NA
Merced	6.77
Monterey	5.79
Nevada	8.06
Orange	5.65
Riverside	NA
Sacramento	6.92
San Bernardino	6.48
San Diego City	4.00
San Diego County	6.88
San Joaquin	5.91
San Luis Obispo	4.41
San Mateo	NA
Santa Barbara	4.36
Santa Clara	4.27
Santa Cruz	NA
Shasta	NA
Sierra	NA
Siskiyou	4.46
Solano	NA
Sonoma	4.96
Stanislaus	8.04
Sutter/Yuba	NA
Tehama	NA
Tulare	6.55
Tuolumne	7.35
Ventura	NA
Yolo	12.60
Average cost[a]	$5.91

a. Weighted by the number of participating children in each county.

CHAPTER II

DESIGN OF THE DENTAL DISEASE PREVENTION PROGRAM EVALUATION STUDY

The DHS contracted in 1981 with the Center for Dental Services Research of the UCSF to evaluate the DDPP. The center examined a sample of participating students, both before the DDPP began and again two years later. The center submitted the results of its study, Evaluation of the State of California's Children's Dental Disease Prevention Program,[1] to the DHS in September 1985. Chapters II through IV of this report are based largely on the center's study.

SAMPLE GROUPS

Because the DHS also wished to examine the effects of water fluoridation on dental health, the center examined a sample of participants from two fluoridated communities (Barstow and Victorville) in San Bernardino County and two nonfluoridated communities (Monterey and Pacific Grove) in Monterey County. Comparable numbers of students were examined in the two counties, and the evaluation team reported results by grade and by race (white and nonwhite) with race identification performed by sight. (The numbers of students in individual nonwhite categories were too small to yield statistically significant results.)

Table 5 lists sample sizes for each grade level and for racial categories.

1. Steven J. Silverstein, Howard F. Pollick, and Jared I. Fine, Evaluation of the State of California's Children's Dental Disease Prevention Program (San Francisco: The Center for Dental Services Research, University of California, San Francisco, CDSR/Q1-0-1985, 1985).

Table 5

Dental Disease Prevention Program
Sample Size
1981-82 and 1983-84

	San Bernardino County (Fluoridated)		Monterey County (Nonfluoridated)	
Grade Level	1981-82 Baseline	1983-84 Follow-Up	1981-82 Baseline	1983-84 Follow-Up
K	242	141	233	73
1	277	96	250	84
2	346	100	184	101
3	310	131	239	107
4	219	116	169	89
5	170	95	118	60
6	130	69	52	65
Race				
White	998	405	683	310
Nonwhite	696	342	561	269
Percent nonwhite	41%	46%	45%	46%
Totals	1,694	748[a]	1,245[a]	579

a. Racial categories do not add to totals due to missing data.

The initial, or "baseline," examination included students in kindergarten through sixth grade. The examiners visited San Bernardino County in the fall of 1981 and Monterey County in the spring of 1982. They returned to the same schools in the spring of 1984 and performed follow-up examinations on children who had been in the DDPP continuously. During their second visit, for example, they again examined sixth graders who they had seen as fourth graders two years before. They also examined children in kindergarten and first grade who they had not seen before. The center's report refers to the first visit as the baseline and the follow-up visit as "exam 1."

A sizeable reduction in the number of program participants occurred between the baseline and follow-up exams. This was due primarily to normal student mobility, the withdrawal of one school district in Monterey County from full participation in the DDPP, and a desegregation program that caused many participants in Monterey County to be reassigned to nonparticipating classrooms. In Monterey County, 61 percent of the baseline participants were not present at the follow-up exam; in San Bernardino County, 63 percent were no longer available.

EXAMINATION PROCEDURES

The baseline examinations were performed by 15 dentists who had received special training so that their evaluations of individual children would be comparable. The follow-up examination team consisted of 7 dentists from the original team and 1 new dentist who had also received the special training.

The examiners gathered several types of data on cavities and gum disease for each child. They counted the number of decayed, missing, or filled permanent tooth surfaces and the number of decayed or filled primary tooth surfaces and measured the incidence of gingivitis or gum disease. Missing primary teeth were not noted, due to the difficulty of determining whether they were lost naturally or to disease. Examiners also noted all restorative treatment needs, and assigned a dollar value to the restorative needs of each child, using the 1981 Medi-Cal fee schedule. In addition to collecting data, the team issued a letter indicating the child's dental health to the school nurse. This information was passed on to the child's parents.

The center measured the effectiveness of the DDPP by comparing the follow-up results for each grade to the baseline results for the same

grade. The follow-up results for fourth graders, for example, were compared to baseline results of fourth graders obtained two years earlier.

CHAPTER III

STUDY SHORTCOMINGS AND RESULTS

The center's evaluation of the DDPP shows a significant decline in the incidence of gum disease among participants during two years between examinations. It also shows an occasionally significant (by grade level) reduction in cavities. These results, however, must be viewed in light of several shortcomings in both the methodology and execution of the study.

In addition, the study found that the dental health of most California school children is very good and that water fluoridation significantly improves their dental health. These findings are not as vulnerable to the problems with the study methodology.

This chapter reviews the study results and identifies the study's shortcomings.

STUDY SHORTCOMINGS

Our review of the DDPP study conducted by the Center for Dental Services Research at UCSF revealed several flaws that complicate interpretation of the results. The study acknowledges most of these problems, some of which could not be foreseen or avoided. In this section, we list the major flaws and discuss the extent to which these flaws may have altered the results from the evaluation.

Control Group Inadequate

In conducting program evaluation studies, researchers usually find it necessary to collect data on a "control group" containing persons who did not participate in the program but are similar to program participants

in other respects. By doing so, researchers can isolate the effects of the program from the effects of other factors.

Instead of selecting children in nonparticipating school districts for use as a control group, the center selected kindergarteners in the participating districts. It did so largely because it was easier to collect data on these children than to expand the study into other areas. The center indicates that it was appropriate to use kindergarteners as a control group in this study because they would have been in the DDPP for only a brief time.

The study found that the control group experienced a decrease in tooth decay and gum disease during the study period. Only the gum disease changes, however, were consistently significant.

There are two problems with using kindergarteners in participating school districts as the control group. First, as the study acknowledges, kindergarteners have few of the permanent teeth that are required for scoring, making the gum disease results unreliable.

Second, the Chief of the DHS Dental Health Section has suggested that kindergarteners may have experienced some dental-care spillover effects before they entered kindergarten from older brothers and sisters who were participating in the DDPP. In other words, the entire family may have begun to take better care of its teeth as a result of the program.

Due to these problems, the center did not use the results from the kindergarteners in its analysis. As a result, there was no control group, and consequently the study was unable to determine to what extent the decrease in dental decay observed in program participants could be part of a general trend, rather than a result of the program.

This is a particularly serious methodological problem given the significant improvement in dental health that is occurring in the population at large. The National Institute of Dental Research, for instance, found that the proportion of children aged 5 to 17 who had no decayed, filled, or missing teeth had increased from 28 to 37 percent during the 1970s. This was an increase of one-third and is commonly attributed to the increase of fluoride available from sources such as toothpaste and water supplies.

Small Size of the Effective Sample Renders Many Results Insignificant

The study was designed to include a sufficient number of children at each grade level to give representative data for that age group. After the baseline examinations were completed, however, the center found that a large proportion of the sample had teeth without any decay or fillings. Specifically, 60 to 63 percent had no decay or fillings in their permanent teeth, and 39 to 47 percent had no decay or fillings in their primary teeth.

As a result, the effective sample size, or the number of children with diseased teeth whose counterparts two years later could exhibit some improvement, was too small in most cases to yield significant results. This problem was compounded by the loss of more than 60 percent of the sample during the course of the study.

Because of the inadequate sample size, the reductions in treatment cost and decay observed by the center are not reliable enough to support the claim that the DDPP would generally produce the same reductions in another test group.

Examiners Disagreed in Many Cases

As indicated earlier, the center trained dental examiners before the study began, in an attempt to standardize the measurement methods. It also tested the consistency of the diagnoses given by the various dental examiners. To do this, every tenth child was examined by two dentists, and the results from these examinations were compared.

The examiners agreed in more than 95 percent of their diagnoses of decay, treatment needs, and general tooth status. This, however, mainly reflects the good dental health of those in the study group. For the small group of students with dental problems, there were significant disagreements among the examiners. In fact, when one examiner indicated caries (cavities) or the need for treatment, the other examiner disagreed approximately 50 percent of the time. It is precisely this group of children who form the core of the effective sample.

The extent of disagreement among the examiners was even greater when it came to diagnosing gingivitis (or gum disease). The examiners measured gingivitis using an index, where "1" means no gum redness, "2" means some redness, and "3" means a continual redness of the gums. The dentists disagreed in more than 50 percent of the cases. In 28 percent of these cases, one examiner said stage 1 and the other said stage 3.

This level of disagreement between the examiners means that the data from both baseline and follow-up examinations depend heavily on which examiner saw which child. It limits the reliability of any measured improvement in the dental health of the participants.

The Results Cannot Be Attributed to Specific Program Components

Because all children in the study groups participated in all components of the DDPP, there is no way to determine the effects, or cost-effectiveness, of individual program components. For instance, brushing and flossing affect both caries formation and gingivitis, while the fluoride mouthrinse affects only caries. The study provides no way to determine whether one component was more effective than another in reducing the incidence of caries.

Other Problems

Most dental health studies run at least three years. The center's study covered slightly more than two years of DDPP experience in San Bernardino and about two years' experience in Monterey, and as a result it loses both some reliability and some comparability to other studies.

The UCSF team selected towns in Monterey and San Bernardino Counties to exemplify fluoridated and nonfluoridated communities. Local program administrators, however, identified two reasons why the assumption that the populations in the two locations were homogeneous may not be valid. First, Monterey County may not be representative of a nonfluoridated community because it contains a large population of military children who may have lived for several years on fluoridated military bases in other communities. Second, San Bernardino County may not be representative of a fluoridated community because many inhabitants drink bottled (unfluoridated) water. The local water contains many minerals and is considered unpalatable by these residents.

Finally, there are two other limitations on our ability to generalize the results of the study to the state as a whole, or to

calculate potential state cost savings. First, the study participants were all from moderate-sized towns. Results for rural or center-city school districts might be very different. Second, the researchers could not obtain information on the family income of study participants. Thus, we cannot tell how many children in the study group were eligible for Medi-Cal assistance or whether improvements in their dental health were typical of the group as a whole. This makes any estimates of potential savings to the Medi-Cal program tenuous at best.

RESULTS OF THE STUDY

With the foregoing caveats in mind, we now discuss the results of the study conducted by the UCSF Center for Dental Services Research. These results can be summarized as follows:

Dental Health

- Most children have healthy teeth. Table 6 shows that at the baseline exam, 60 to 63 percent of the participants had no fillings or decay in their permanent teeth.
- Some children have substantial amounts of decay and treatment needs.
- Children in communities with fluoridated drinking water (San Bernardino County) had a lower number of decayed, missing, and filled teeth than children in the nonfluoridated communities (Monterey County). Table 7 shows the relative number of damaged teeth in the two counties.
- At least 50 percent of the cavities found might have been prevented by using sealants because they were located in "sealable" pits and fissures of permanent teeth. (A sealant is a

clear plastic coating that is applied to the chewing surface of 6- and 12-year molars to prevent cavity formation.)

- Children who experience decay in primary teeth had approximately 50 percent of the decay they were likely to get by the time they entered kindergarten.
- Nonwhite children had substantially more decay and treatment needs than white children.

Effect of the Dental Disease Prevention Program

- Children at most grade levels showed a reduction in decay between baseline and follow-up examinations; but, in most cases, the reduction was not statistically significant. Table 8 presents the decay results using a standard measure--the number of damaged tooth surfaces.
- All grade levels showed a statistically significant reduction in gingivitis (gum disease) scores, as Table 9 shows.
- The DDPP appears to have increased family awareness of treatment needs. Table 6 shows that the percentage of children with untreated decayed teeth decreased by from 3 to 9 percent during the course of the study.
- In all but one subsample (second grade in San Bernardino County), the cost of needed treatment showed a decline. Table 10 shows that the percentage reduction in treatment needs ranged from 14 to 55 percent. In approximately half of the subsamples, the reductions were statistically significant. Overall, the percentage reduction in treatment needs was 20 percent in San Bernardino County and 42 percent in Monterey County.

Table 6

Increase in Number of Students
With No Past or Present Dental Treatment Needs
1981-82 to 1983-84

	San Bernardino (Fluoridated)		Monterey (Nonfluoridated)	
Percent with no present treatment needs				
Baseline	61%		57%	
Follow-up	66%		69%	
Change	+5		+12	
	Primary Teeth	Permanent Teeth	Primary Teeth	Permanent Teeth
Percent with no present treatment needs				
Baseline	71%	80%	70%	80%
Follow-up	77%	83%	81%	83%
Change	+6	+3	+11	+3
Percent with no past or present treatment needs				
Baseline	47%	63%	39%	60%
Follow-up	51%	65%	49%	56%
Change	+4	+2	+10	-4

Table 7

Effect of Fluoridation on Number of
Damaged Tooth Surfaces
1981-82 to 1983-84

	Baseline	Follow-Up	Reduction
Number of Decayed or Filled Primary Teeth			
Monterey (nonfluoridated)	6.26	4.59	1.67
San Bernardino (fluoridated)	4.17	3.46	0.71
Difference	2.09	1.13	--
Percent difference	33%	25%	--
Number of Decayed, Missing, or Filled Permanent Teeth			
Monterey (nonfluoridated)	1.95	2.31	-0.36
San Bernardino (fluoridated)	1.33	1.23	0.10
Difference	0.62	1.08	--
Percent difference	32%	47%	--

Table 8

Reduction in Average Number of Decayed, Missing, and Filled Tooth Surfaces 1981-82 to 1983-84

	GRADES						
	K	1	2	3	4	5	6
Number of Decayed or Filled Primary Teeth							
San Bernardino (fluoridated)							
Baseline	3.70	4.43	4.39	5.31	4.78	3.19	1.42
Follow-up	2.66	2.70	5.29	5.11	3.20	2.69	1.78
Reduction	1.04	1.73	-0.90	0.20	1.58	0.50	-0.36
Significant?[a]	No	Yes	No	No	Yes	No	No
Monterey (nonfluoridated)							
Baseline	5.12	6.26	7.92	7.82	5.90	4.57	3.55
Follow-up	2.99	4.13	5.89	7.88	3.78	4.10	1.06
Reduction	2.13	2.13	2.03	-0.06	2.12	0.47	2.49
Significant?[a]	Yes	Yes	Yes	Yes	Yes	No	Yes
Number of Decayed, Missing, or Filled Permanent Teeth							
San Bernardino (fluoridated)							
Baseline	0.08	0.54	0.84	1.43	2.01	2.92	3.13
Follow-up	0.19	0.34	0.90	1.42	1.62	2.26	2.62
Reduction	-0.11	0.20	-0.06	0.01	0.39	0.66	0.51
Significant?[a]	No	No	No	No	No	Yes	No
Monterey (nonfluoridated)							
Baseline	0.20	0.61	1.29	2.47	3.66	3.84	6.56
Follow-up	0.03	0.71	1.41	2.29	3.46	3.99	5.32
Reduction	0.17	-0.10	-0.12	0.18	0.20	-0.15	1.24
Significant?[a]	Yes	No	No	No	No	No	No

a. Statistically significant at the 95 percent level.

Table 9

Reduction in Average Gingivitis (Gum Disease) Scores[a]
1981-82 to 1983-84

	GRADES						
	K	1	2	3	4	5	6
San Bernardino (fluoridated)							
Baseline	2.70	2.44	2.43	2.35	2.35	2.45	2.42
Follow-up	1.91	1.94	1.91	1.86	1.78	1.82	1.62
Reduction	0.79	0.50	0.52	0.49	0.57	0.63	0.80
Percent reduction	29%	20%	21%	21%	24%	26%	33%
Significant?[b]	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Monterey (nonfluoridated)							
Baseline	2.59	2.34	2.36	2.31	2.16	2.14	2.63
Follow-up	1.78	2.02	1.90	2.00	1.79	1.79	1.79
Reduction	0.81	0.32	0.46	0.31	0.37	0.35	0.84
Percent reduction	31%	14%	19%	13%	17%	16%	32%
Significant?[b]	Yes	Yes	Yes	Yes	Yes	Yes	Yes

a. Gingivitis scoring is on a 1-3 scale, where "1" is no gum redness, "2" is some redness, and "3" is continual gum redness.
b. Statistically significant at the 95 percent level.

Table 10

Reduction in Treatment Costs[a]
1981-82 to 1983-84

	GRADES							Weighted Average
	K	1	2	3	4	5	6	
San Bernardino (fluoridated)								
Baseline	$16.43	$18.91	$20.85	$27.84	$17.60	$12.57	$14.30	$19.43
Follow-up	11.56	16.32	29.48	19.45	15.09	5.33	9.76	15.53
Reduction	$4.87	$2.56	-$8.63	$8.39	$2.51	$7.24	$4.54	$3.90
Percent reduction	30%	14%	-41%	30%	14%	58%	32%	20%
Significant?[b]	No	No	No	Yes	No	Yes	No	--
Monterey (nonfluoridated)								
Baseline	$20.80	$25.45	$34.70	$37.12	$32.74	$12.48	$23.22	$27.85
Follow-up	9.34	15.10	24.94	18.42	17.37	8.02	13.58	16.14
Reduction	$11.46	$10.35	$9.76	$18.70	$15.37	$4.42	$9.64	$11.71
Percent reduction	55%	41%	28%	50%	47%	35%	42%	42%
Significant?[b]	Yes	Yes	No	Yes	Yes	No	No	--

a. Calculated as cost for restorative treatment of decayed teeth, using the 1981 Medi-Cal fee schedule.
b. Statistically significant at the 95 percent level.

CHAPTER IV

IMPACT OF THE DENTAL DISEASE PREVENTION PROGRAM ON STATE EXPENDITURES

Chapter 1134 directs the Legislative Analyst's office to determine the impact of the DDPP on state expenditures for medical and dental care. Unfortunately, we conclude that because of the deficiencies in the UCSF study discussed in the previous chapter, it is impossible to estimate the amount of any savings which can be attributed to the program. At the same time, however, we conclude that the dental health of children participating in the DDPP improved to a significant (but unmeasured) extent. We base this conclusion on (1) statistically significant findings from some of the subsamples, (2) subjective feedback from county DDPP coordinators, and (3) the results of a recent national study that evaluated a dental health regimen similar to California's.

In this chapter, we discuss the potential cost savings resulting from the program and subjective indications of program effectiveness. We discuss the results from the national study in Chapter V.

IMPACTS ON EXPENDITURES

If it is successful, the DDPP should (1) lower current Medi-Cal costs for treatment of caries, (2) reduce future Medi-Cal costs for treatment of caries, periodontal disease, and medical complications, and (3) reduce costs for state employee dental benefits. These savings would be offset to some extent by the costs of the prevention program.

The potential savings to the Medi-Cal program in the future deserve special mention. If the DDPP is successful, it could significantly reduce

the cost of repairing caries. (The teen years are the apex of caries formation in permanent teeth.) It could also reduce the costs of treating gum disease (periodontal work). Severe periodontal problems, as well as the costs of correcting these problems, do not occur until patients are much older. As we noted in the previous chapter, the most significant finding from the UCSF study was the reduced incidence of gum inflammation.

At the present time, it is not possible to estimate the short- and long-term savings to the state for the following reasons:

- The problems with the design of the UCSF study, discussed in Chapter III, make the study's results unreliable. These problems include lack of a true control group, the short time period covered by the study, and the inability to assess individual components of the program.
- The problems encountered in conducting the study make the results even less reliable. These problems include the small effective sample size, the loss of more than half of the participants, and the level of examiner disagreement.
- Except for the reduction in gingivitis scores, the study's findings are not consistently significant. Specifically, the results were not statistically significant at the .05 confidence level. This means that there is at least a 5 percent chance that the observed reduction in treatment needs was due to chance, rather than to the program itself.
- We cannot apply the findings from the study to the Medi-Cal program because we lack data on the participation rate of Medi-Cal eligible children in the DDPP program. Similarly, we

have no data to indicate whether treatment need reductions for Medi-Cal eligibles differed from the sample averages, on the participation of state employee dependents in the DDPP, and on the local fluoridation status of each participating school district.

- We are unable to obtain data on state costs for dental treatment of state employee dependents aged 6 to 12 years.
- Reductions in periodontal and adolescent/adult restorative work will not be measurable for several years, because the program is too new to have ex-participants in the age groups where these costs become significant.

A Measuring Stick for Cost Savings

Although we are unable to estimate the cost savings attributable to the DDPP, we can provide a rough measuring stick for gauging the potential cost savings. Specifically, by making certain assumptions about the distribution of Medi-Cal eligible children and fluoridated water, we can estimate the Medi-Cal savings that would result from every 10 percent reduction in treatment costs achieved by the DDPP.

Medi-Cal Eligibles and Costs

Medi-Cal staff calculate that in 1983 the state spent $5,833,000 for restorative dental treatment involving children aged 6 to 12 years. This is the age group covered by the DDPP. Since there are approximately 450,000 eligible children in this age group, the average cost per eligible child amounts to $12.96. One-half of this amount was financed from the state General Fund; the remainder was financed with federal funds.

In 1983-84, statewide public school enrollment in kindergarten through sixth grade was 2,106,000. Therefore, 21.4 percent of all children in this age group were eligible for Medi-Cal.

Program Participation by Medi-Cal Eligible Children and Costs

In 1983-84, 336,000 children participated in the DDPP. Assuming that the percent of participating children eligible for Medi-Cal was equal to the statewide average, approximately 21.4 percent, or 72,000 DDPP participants, were eligible for Medi-Cal.

Again, assuming that these Medi-Cal eligible children are typical of Medi-Cal eligible children generally, treatment costs for these participants would have been approximately $933,000 in 1983-84 had the DDPP not existed (72,000 x $12.96).

Potential Cost Savings

Using these assumptions, every 10 percent reduction in treatment costs would have saved the Medi-Cal program approximately $93,000 in 1983-84. Of these savings, one-half, or $46,500, would have accrued to the General Fund. Thus, even if the DDPP eliminated all treatment needs for participating Medi-Cal eligibles, the short-term savings would have fallen $1,568,000 short of the DDPP's costs.

Of course, all children participating in the DDPP and their parents stand to benefit from a reduction in treatment needs. If the average child has the same treatment needs as a Medi-Cal child ($25.92, which allows for the fact that Medi-Cal rates are approximately 50 percent of actual billing rates), the parents of non-Medi-Cal eligibles would save $684,000 for every 10 percent reduction in treatment costs.

SUBJECTIVE INDICATIONS OF PROGRAM EFFECTIVENESS

The DDPP yields other results that cannot be measured in a "before and after" comparison of dental treatment needs. To get a fix on these results, we spoke to DDPP coordinators at five county health or education departments. These coordinators cited various short- and long-range benefits from the DDPP. Some were as mundane, but important, as teachers now being able to tolerate normal proximity to students who previously exhibited severe bad breath. Teachers report that students are making better food choices, which affects their classroom behavior, and are absent or inattentive less often due to dental problems.

One of the coordinators explained that her program is self-targeting. She stated that the teachers who ask to participate are those who recognize that their students, if not taught how to care for their teeth in school, ultimately will suffer overwhelming disadvantages in the job market because of unsightly teeth and gums. The coordinator cited special need for the DDPP in schools with high immigrant populations, because these groups generally have not had the training or facilities in their native land to care for their teeth, and once in this country, they often live in very similar circumstances.

CHAPTER V

OPTIONS FOR IMPROVING THE COST-EFFECTIVENESS OF THE DENTAL DISEASE PREVENTION PROGRAM

The current DDPP design includes educational, prophylactic, and preventive agent components as part of a multi-pronged attack on tooth and gum disease. The department's experience in implementing the program, the findings of the UCSF study, and other recent research[1] suggest that this program design may not be the most cost-effective in achieving the Legislature's objective. In particular, it may be more cost-effective to expand the coverage of some program elements to more children and to target other program elements more narrowly. This chapter describes program options and recent research on their effectiveness.

A few of the findings from the UCSF study are particularly relevant to a reconsideration of the program's design. As we discussed in Chapter III, the study revealed that most children have sound teeth, that kindergarteners already suffer from 50 percent of the primary teeth problems they will experience, and that for this age group, most decay in permanent teeth occurs in sealable surfaces. It also found that nonwhite students needed more restorative work than white participants.

These findings should also be considered in connection with other state dental health programs. The most important of these programs is the Child Health and Disability Prevention (CHDP) program, which offers periodic health checkups to eligible children. Under this program, children whose family income falls below 200 percent of the AFDC income standard are eligible for a free examination when they enter first grade.

Medi-Cal eligible children may receive additional periodic examinations. The CHDP program offers an alternative delivery channel and methods of segmenting the population in order to target particular DDPP components more effectively.

DESIGN OPTIONS

The Legislature has several delivery options if it decides to continue funding a children's dental health program. Each option offers a different mix of two generally conflicting goals: to reduce dental disease among all Californians and to produce the biggest payoff, in terms of reduced state Medi-Cal and employee benefits costs, per program dollar. The "correct" choice among these options is something only the Legislature can decide.

The first group of delivery options involves potential modifications to the school-based DDPP. These options can be divided into three subcategories, based on who participates, what the program components are, and how flexible the program is. The second group of delivery options would be provided independently of the school system. These alternatives include mandating fluoridation of public water supplies and supplementing the CHDP program.

Participation Options for School-Based Programs

- Target the program more carefully so that aid is focused on the relatively few children with significant dental health problems or those who depend on Medi-Cal for dental coverage. Giving priority to applicants in communities without fluoridated water or with high proportions of nonwhite or immigrant students also should result in a greater statewide decrease in children's

restorative needs than continuation of the current program. Alternatively, focusing the program on children eligible for Medi-Cal would provide the biggest General Fund savings by reducing the number of caries in this population and, thus, the amount of claims for restorative work.

- Develop intermediate and high school programs. Such programs might consist simply of occasional educational follow-ups designed to promote continuation of habits formed during DDPP participation in elementary school. These programs would be responsive to the evidence that the teen years are the peak years for cavity formation.
- Perform assessment exams on samples of children in all eligible school districts (perhaps over the course of several years) to determine which ones have the most severe dental health problems. Give priority to those schools.

Component Options

- Include the application of sealants, at least on a trial basis. A sealant is a plastic coating applied to the chewing surface of 6- and 12-year molars in order to prevent cavities from forming. Fluoride rinses protect flat tooth surfaces, and brushing and flossing deter decay between teeth, but chewing (occlusal) surfaces are not well protected by the existing program. Sealants can be applied by dental hygienists.
- Limit the program and its costs to dental care education and the fluoride mouthrinse. A larger proportion of the K-6 population could participate in such a program at no increase in costs to the state.

Flexibility

- Allow school districts to choose which program components they will offer to students. A sliding reimbursement scale would provide state assistance for only the most effective portions of the program. Many more teachers might be willing to offer (and schools to pay for) a weekly mouthrinse than everyday brushing and flossing. Students would make at least some gains over complete nonparticipation.
- Recognize the higher program costs incurred by participating districts in rural areas. The DHS may be able to help rural counties form more economical joint programs; in a few cases, a higher reimbursement rate may be necessary.

Non-School-Based Options

- Initiate a major statewide campaign to educate the public on the benefits of fluoridated drinking water. The UCSF study showed that at virtually every grade level, children living in the fluoridated San Bernardino area had fewer caries than their counterparts in nonfluoridated Monterey. Community water supplies can be fluoridated for less than one dollar per capita annually. Persuading California cities to implement fluoridation programs voluntarily would avoid any mandated cost for the state.
- Develop preschool programs in response to the study finding that about 50 percent of all cavities in primary teeth occur by the time the child is in kindergarten. Preservation of primary teeth is important for several reasons, one of the most critical being their role as "place savers" for the permanent teeth still

in the gum above or below them. Extending the DDPP to preschoolers could reduce not only the immediate cost of filling decayed primary teeth but also the longer-range costs of caring for poorly spaced permanent teeth.

- Add a comprehensive preventive component to the dental portion of the CHDP program. Currently, this program funds medical exams for children entering school whose family income falls below 200 percent of the AFDC income standard. Medi-Cal eligible children may receive additional periodic examinations. The existing dental portion of the examination consists of a visual screening by the physician and a brief review of nutritional and prophylactic principles. If the physician notes any existing problems, he or she encourages the parent to take the child to a dentist. If the child is Medi-Cal eligible, he or she gives the parent a list of area dentists who accept Medi-Cal patients. Focusing on preventing dental problems among Medi-Cal eligibles would create the biggest General Fund return for each dollar spent on a children's preventive dental program. Incorporating the program into the existing CHDP program could provide an easy way to identify and reach the target population. In particular, the CHDP program offers a channel to deliver preventive information and care to preschool children, in response to the UCSF finding regarding the significant damage to primary teeth that occurs during the preschool years. The CHDP program also could be a means of channeling relatively expensive treatments, such as sealants, to those children who could generate

significant General Fund costs if their teeth were left untreated. The key to a preventive dental component of the CHDP program, however, would be getting the child and parent to the dentist in the first place. The lack of a dental check requirement upon entrance to first grade, let alone any incentive to visit a dentist during the preschool years, almost insures that the preventive component would have to be incorporated into the medical exam or aggressively brought to the clientele in some other way. Experience under the CHDP program indicates that parents often do not pursue dental care recommendations because of the effort and cost involved. To take a child to the dentist, they need to make an appointment, arrange for transportation, arrange care for other children, and perhaps take time off of work.

These options could be used singly or in almost any combination to restructure the existing DDPP. Considerations involving treatment cost and the proper mix of goals (cost savings versus broad coverage) would dictate the ultimate program design. The results of the UCSF study, however, suggest that a program focusing on the small segment of the population with poor dental health, on reaching children before they enter school, and on children living in nonfluoridated communities would result in the most significant improvements in dental health.

RECENT RESEARCH ON PROGRAM OPTIONS

The results from several national studies of children's dental disease prevention may be of interest to the Legislature in deciding whether to continue California's DDPP in its current form.

Targeting

National studies bear out the UCSF finding that dental disease is concentrated in a relatively small number of children. The American Fund for Dental Health found that 20 percent of the children who participated in its National Preventive Dentistry Demonstration program (NPDDP) accounted for almost 60 percent of all decay found.[2] The program, which was funded by the Robert Wood Johnson Foundation, tested a variety of clinical and classroom regimens on 20,000 children nationwide.

Unfortunately, targeting remains an inexact science. The NPDDP researchers attempted to predict how many damaged tooth surfaces participants in the simplest regimen would develop in the course of the study, using such factors as socioeconomic status, site, and the number of erupted and decayed teeth at baseline. They successfully predicted only 6 to 10 percent of the variance in decay scores that were measured at the end of the study.

Program Components

The NPDDP included tests of several possible preventive programs, from education only to a complete regimen consisting of education, plaque control, preventive agent prophylaxis and fluoride gel application, and sealants. The complete regimen cost $55 per child per year (all figures are in 1981 dollars). For children who started the program as fifth graders, the regimen saved an estimated two tooth surfaces from decay in four years. Simply fluoridating the local water supply was half as effective (one surface saved) at an annual cost of less than $1 per child.

The fluoride mouthrinse and fluoride tablet program saved, on average, from .03 to .44 surfaces over four years, with larger savings

accruing to younger participants and participants in nonfluoridated communities. The average cost of repairing each surface was $19.92 in 1981. The annual cost of the fluoride treatments was $3.41. Even for the group with the best results, then, the four-year cost of the program ($13.64) was higher than the best savings in restorative costs ($8.76). Adding a classroom plaque control and education program, which produced a regimen similar to California's DDPP, raised the annual cost to $15.15 per child but produced no additional reductions in cavity formation.

Finally, the NPDDP included a program that was completely clinic-based--there was no classroom component. Treatment included sealants and prophylaxis/fluoride gel application and saved from 1.24 to 1.83 surfaces over four years. The annual cost of the program was $40.01. The four-year cost of the program exceeded the savings in restoration costs. The savings might equal the costs, however, if the program was targeted at high-risk individuals and if the frequency of clinical visits was curtailed somewhat.

1. Steven P. Klein, Harry M. Bohannan, et al., "The Cost and Effectiveness of School-Based Preventive Dental Care," American Journal of Public Health, 75, (April 1985).
2. Op. cit., page 386.

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

Due to the mostly inconclusive results of the UCSF study, we can reach only limited conclusions about the school-based DDPP. They are as follows:

- The DDPP is effective in reducing gum inflammation.
- The DDPP may reduce the incidence of decay in participants' teeth, but the results do not prove this conclusively.
- The program is not cost-effective when only the state's General Fund costs and savings are considered. It probably is cost-effective when all public and private long-term costs and savings are considered.
- The DDPP is relatively less effective in a fluoridated community.

Whether the program should be continued is a policy decision, one that must be made based on whether narrow (General Fund) or broad (total public and private) cost savings are the relevant evaluation measures.

The question of program continuation, of course, cannot be examined separately from the issue of program design and content. Our analysis of the UCSF study and other information indicates that the program would be more effective in achieving the original public health and cost savings goals set forth in Chapter 1134, if certain changes in targeting, content, and administration were adopted. Specifically, the Legislature could decrease both public and private costs by concentrating the broad coverage of relatively low-cost program components in certain school districts.

Research also suggests a potential payoff for targeting higher-cost components on even smaller groups.

If the Legislature decides to continue a children's dental disease prevention program, we recommend that it modify the program design as follows:

- Direct the DHS, in allocating funds, to give preference to school districts with nonfluoridated drinking water, high immigrant populations, and high AFDC caseloads.
- Establish a pilot project for sealing the newly erupted 6- and 12-year molars of a test group of DDPP participants.
- Ask the DHS to investigate the feasibility of incorporating a DDPP into a curricula of preschool programs that serve high-risk populations or into the CHDP program.
- Direct the DHS to assist rural counties in establishing cooperative programs to reduce costs.

While these changes would not be sufficient to make the program cost-effective in terms of General Fund expenditures, they would help direct dollars that are allocated to the DDPP to more needy students.